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Clinical Role of Serum Lactate Dehydrogenase Assessment in Critically Ill Pediatric Patients with Sepsis

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Sepsis is a systemic inflammatory disorder that may be associated with higher rate of morbidity and mortality in pediatric patients admitted to intensive care unit with sepsis. Usage of different biomarkers may be helpful for early detection and appropriate management of sepsis. Our objectives was to investigate the role of serum lactate dehydrogenase in prediction of sepsis in critical pediatric patients, and its relation with prognostic scoring systems. A prospective cohort study was conducted at El Galaa teaching hospital between January 2020 and December 2020. A total of 168 pediatric patients were divided into the septic group (84) critically ill patients with sepsis from the pediatric intensive care unit (PICU)] and control group (84 stable patients admitted to the inpatient word). Demographic and clinical data were collected, routine laboratory investigation including LDH on admission and after 24 hours were performed. Pediatric Risk of Mortality III (PRISMIII) and Sequential Organ Failure Assessment (pSOFA) were assessed. Serum LDH level was significantly higher in septic group than control (P=0.000) and in non-survivor than survivor group (P=0.000). Also there was statistically significant correlation between survivor and non-survivor as regarding length of hospitality, pSOFA score and PRISMIII score. There was statistically significant positive correlation between LDH, PRISMIII (r=0.842, P<0.001) and pSOFA (r=0.785, P<0.001). We concluded that LDH is a useful marker in predicting of sepsis in critically ill pediatric patients especially when combined with prognostic scoring systems.

Keywords: Lactate Dehydrogenase; Pediatric Intensive Care Unit; Pediatric Risk Of Mortality III; Psofa; Sepsis.

Sepsis is a life-threatening health problem that may be associated with increased mortality in children and young adult even in developed countries. It has been defined as a systemic inflammatory response syndrome (SIRS) caused by blood stream infections or organ dysfunction caused by a host response deregulation to infection[1].

Moreover, SIRS may be due to infectious and non-infectious causes. Pediatric SIRS is defined by abnormal temperature: hyperthermia or hypothermia (>38.5°C or <36°C); or abnormal leukocyte count: elevated or depressed leucocytic count for age, or >10% immature neutrophils, tachycardia or bradycardia, tachypnea[2]. Abnormal temperature and leukocyte count are essential for diagnosis of SIRS, while abnormal respiratory rates and heart rate are common in pediatrics may occur in clinical conditions and unnecessarily indicate SIRS[3].

Biomarkers can play an important role in providing a timely diagnosis of sepsis, helping in distinguishing between infectious and non-infectious SIRS and the decision-making in the initial management [4]. In pediatrics, one of most commonly used biomarker to differentiate sepsis from non-infectious SIRS is serum lactic dehydrogenase (LDH) [5]. It's one of the enzyme involved in anaerobic metabolic pathway, its level increased in multiple clinical conditions associated with tissue damage [6]. Many studies suggested that significant elevation in serum LDH levels early in sepsis can be useful as a marker for reflecting the extent of tissue damage[7].

Elevated serum LDH in pediatric patients with sepsis reflect imbalance between lactate production and clearance [8]. Increased serum lactate levels in sepsis may occur through several mechanisms, including an aerobic glycolysis as a result of impaired oxygen delivery to tissue as well as tissue hypoperfusion, stress as endogenous and exogenous catecholamines are highly associated with lactic acid production in sepsis, elevated bacterial load [9] and decreased lactate clearance that induced by hepatic and renal dysfunction [10].

Aim of the study

To investigate the role of serum lactate dehydrogenase in prediction of sepsis in critical pediatric patients, and its relation with prognostic scoring systems.

Patients and Methods

A prospective cohort study was conducted at El Galaa teaching hospital in Cairo between January 2020 and December 2020. The study was carried out on 168 ill children, who were divided into 2 groups: Cases group (1): 84 critically ill children who were admitted to the PICU with sepsis and Control group (2): 84 stable control admitted to the inpatient word. Aiming to assess serum LDH levels in predicting sepsis in pediatric critical patients, and also the relation between LDH and scoring systems (Pediatric Risk of Mortality (PRISMIII), Pediatric Sequential Organ Failure Assessment pSOFA). The study was conducted after obtaining informed consent from the caregivers of participants and the approval of the Ethics Committee of National Research Centre.

Inclusion criteria

1. Age:1 month-14 years old
2. Sex: male or female
3. Patients with sepsis (defined as SIRS in the presence of or as a result of suspected or documented infection) Goldstein et al. [11] admitted to the PICU.

Exclusion criteria

1. Patients on steroids
2. Patients known with metabolic disorders, chronic liver and kidney disease.
3. Death in less than48 hours.
4. Patients with acute hemolytic anemia.
5. Post-operative patients

Ethical considerations

Informed consent was obtained willingly from all patients, control and/or their legal guardians before enrollment in the study. The ethics committee of General Organization of Teaching Hospital and Institutes approved the study design and conducted according to Helsinki declaration.

All studied cases were subjected to the following

1. Full history and data including sex, age, primary diagnosis, history of chronic illness and chronic medication use and current medications.
2. Complete clinical and systemic examinations including vital signs especially heart rate, blood pressure and temperature, respiratory rate, conscious level of patients, presence of infection or sepsis
3. Laboratory investigations on admission including: Complete Blood Counts(CBC),C-reactive protein (CRP), prothrombin time (PT), partial thromboplastin time (PTT), international normalized ratio (INR), potassium (K), sodium (Na), Blood Urea Nitrogen (BUN), serum creatinine (Cr), alanine transaminase (ALT), aspartate transaminase (AST), LDH (day1) and after 24 hour(day2).
4. System failure assessment (pSOFA score and PRISMIII score).Use of mechanical ventilation.
5. Evaluation of patients outcome (death or improved) and duration of hospital stay.

Samples collection, LDH assay

About 5 ml of whole blood were collected from cases and controls by aseptic vein puncture for LDH assay. Samples were immediately centrifuged and the serum was used for analysis on blood chemistry analyzer Dimension RXLMAX integrated chemistry system from Siemens Healthcare S.A.E, Germany.

Statistical analysis

Data were collected, revised, coded

and entered to the Statistical Package for Social Science (IBMSPSS) version 23. The quantitative data with parametric distribution were presented as mean, standard deviations and ranges while with nonparametric distribution were presented as median with inter-quartile range (IQR). Also qualitative variables were presented as number and percentages. The comparison between groups regarding qualitative data was done by using Chi-square test and/or Fisher exact test when the expected count in any cell found less than 5. The comparison between two independent groups with quantitative data and parametric distribution was done by using Independent t-test and with nonparametric distribution were done by using Mann-Whitney test. Comparison between two paired groups regarding nonparametric data was done by using Wilcoxon Rank test. Spearman correlation coefficients were used to assess the correlation between two quantitative parameters in the same group. Univariate and multivariate logistic regression analysis was used to assess the predictors of cases group and their outcome. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the level of <0.05.

RESULTS

In the cases group, median age was 13 (6–26) months, 50.0% were males, and 50.0 % were females. In the control group, mean age was 13 (6–34) months, 41.7% were males, and 58.3% were females. There was significant difference in both groups regarding length of hospital stay, use of mechanical ventilation and outcome, pSOFA score and PRISMIII score (p-value=0.000).

There was significant difference between both groups regarding granulocyte/lymphocyte ratio, total leucocytic count(TLC), creatinine(Cr), Urea, aspartate transaminase (AST), alanine transaminase (ALT), partial thromboplastintime (PTT), international normalized ratio(INR), C-reactive protein (CRP), lactate dehydrogenase (LDH) on day1 and 2.

Table 1. Demographic and clinical data of cases and control groups

Variable		Control group No.=84	Cases group No.=84	P-value
Age in months	Median(IQR)	13(6–34)	13(6–26)	0.722
	Range	1–90	1–122	
Sex	Male	35(41.7%)	42(50.0%)	0.278
	Female	49(58.3%)	42(50.0%)	
Length of hospitalstay in days	Median(IQR)	8(7–10)	10(8–16)	0.000
	Range	5–18	5–34	
Diagnosis	Neurological disease	4(4.8%)	12(14.3%)	–
	Cardiovascular disease	0(0.0%)	16(19.0%)	
	Respiratory disease	28(33.3%)	34(40.5%)	
	Blood born infection	0(0.0%)	14(16.7%)	
	Gastrointestinal disease	39(46.4%)	8(9.5%)	
	Renal infection	8(9.5%)	0(0.0%)	
	Others	5(6.0%)	0(0.0%)	
Outcome	Survival	84(100.0%)	50(59.5%)	0.000
	Non-survival	0(0.0%)	34(40.5%)	
Mechanicalventilation	No	84(100.0%)	62(73.8%)	0.000
	Yes	0(0.0%)	22(26.2%)	
SOFA	Median(IQR)	5.5(4–7)	10(7–17)	0.000
	Range	2–11	4–22	
PRISMIII	Median(IQR)	22.5(18–28)	44.5(23–62)	0.000
	Range	3–48	10–71	

P-value>0.05: Non-significant; P-value<0.05: significant; P-value<0.01: highly significant

There was statistically significant correlation between lactate dehydrogenase at admission and hemoglobin, granulocyte/lymphocyte ratio, total leucocytic count (TLC), creatinine (Cr), Urea, aspartate transaminase (AST), alanine transaminase (ALT), partial thromboplastin time (PTT), international normalized ratio (INR), C-reactive protein (CRP), serum potassium in cases group.

There was statistically significance between survivor and non-survivor as regarding length of hospital stay, mechanical ventilation, pSOFA score and PRISMIII score.

The previous ROC curve shows that the best cutoff point between cases and controls regarding granulocyte/lymphocyte ratio was found>7.5 with sensitivity of 61.90%, specificity of 90.48% and AUC of 81.8%, regarding C-reactive protein was found>24 with sensitivity of 52.38%, specificity of 82.14% and AUC of 70.0%, regarding SOFA score was found>8 with sensitivity of 66.67%, specificity of 88.10% and AUC of 84.0%, regarding PRISM3 was found>28 with sensitivity of 71.43%, specificity of 78.57% and AUC of 78.7% while regarding LDH at day1 the best cutoff point was found>302 with sensitivity 80.95%, specificity 76.19% and AUC 84.5%.

The previous univariate logistic regression analysis shows that all the previous parameters were associated with sepsis with p-value<0.001; also the

Table 2. Laboratory data of cases and control groups

Variable		Control group No.=84	Cases group No.=84	P-value
Hemoglobin	Mean±SD	9.18±1.72	8.80±1.49	0.128
	Range	5.2–12	5.7–12	
Neutrophil /Lymphocyte countratio	Median(IQR)	4(3.2–6)	9(5–12)	0.000
	Range	2–11.2	3–17	
TLC	Median(IQR)	8.2(7.2–10.5)	11.9(7–21)	0.000
	Range	2.1–22	2.1–35	
Platelet	Median(IQR)	203(167–260.5)	207(113–294)	0.263
	Range	131–653	33–567	
Cr	Median(IQR)	0.5(0.5–0.6)	0.6(0.5–0.8)	0.001
	Range	0.3–1.1	0.3–3.3	
Urea	Mean±SD	21.77±3.77	31.19±14.50	0.000
	Range	11–30	16–72	
AST	Median(IQR)	38(32–45)	47.5(34–87)	0.000
	Range	21–103	22–254	
ALT	Median(IQR)	31(26–38)	36.5(23–67)	0.009
	Range	16–98	16–201	
PT	Mean±SD	12.80±0.94	13.14±1.31	0.051
	Range	12–15	12–16	
PTT	Mean±SD	35.68±4.34	39.26±10.42	0.004
	Range	32–52	32–67	
INR	Mean±SD	1.18±0.20	1.36±0.50	0.002
	Range	1–1.8	1–3.1	
CRP	Median(IQR)	12(0–24)	48(12–96)	0.000
	Range	0–96	0–212	
LDH at admission (day1)	Median(IQR)	243(201–302)	498(312–786)	0.000
	Range	173–457	214–2102	
LDH after 24 hour (day2)	Median(IQR)	230.5(201–301)	415(243–834)	0.000
	Range	168–422	201–2134	
Na^+	Mean±SD	139.52±5.64	138.93±9.37	0.619
	Range	130–152	124–170	
K^+	Mean±SD	3.70±0.73	3.77±0.81	0.561
	Range	2.1–5.2	2.1–5.2	

multivariate analysis shows that the most important predictors for sepsis was found LDH at day1>302 with OR (95%CI) of 8.600(3.358–22.028) followed by SOFA>8 with OR(95%CI)6.871(2.274–20.763) followed by total leucocytes count>11.4 with OR (95%CI)of5.072(1.454–17.697) and lastly INR>1.6 with OR(95%CI) of 0.139(0.023–0.828).

The previous table shows that the outcome of the studied patients was associated with male gender with p-value = 0.028 and OR (95%CI) of 2.750 (1.115–6.782)….

DISCUSSION

Many potential biomarkers and scores come into focus in the last decade for early diagnosis, risk stratification and evaluation of critically ill patient's prognosis in the Emergency Department [12]. Diagnosis of critically ill patients with suspected sepsis is challenging and complex, early identification and immediate management are crucial to increase the chances of favorable outcome of septic patients, depending on clinical evaluation alone is often insufficient for an early diagnosis of sepsis [13].

Serum lactate Dehydrogenase is a cytoplasmic enzyme that is present in different body tissues especially muscle, liver and kidney contain high concentration of LDH as well as red blood cells also contain moderate concentrations of this enzyme. This differential expression of LDH is the basis of its importance as a clinical diagnostic biomarker [14]. Elevated serum LDH is associated with tissue breakdown. Consequently, present in several clinical conditions, such as hemolysis, cancers, severe infections and sepsis [15]. Measuring the LDH level for critically ill patients with suspected sepsis, provides useful information on the severity of the condition and enables monitoring progression of disease [4].

No single biomarkers of sepsis can be used to distinguish sepsis from other inflammatory conditions [16]. The most widely used biomarkers in criticallyill patients with suspected sepsis are (CRP), procalcitonin (PCT), lactate another biological simple inexpensive marker as well as granulocyte and lymphocyte count ratio [17].

The present study demonstrated that the LDH level was significantly increased in case than control as well as in non-surviving critically

Table 3. Correlation of LDH at day1 with the other studied parameters in Cases group

Variable	LDH at admission(day1)	
	r	P-value
Age in months	0.246*	0.024
Length of hospital stay in days	0.548**	0.000
Hb	-0.494**	0.000
Neutrophil / Lymphocyte count ratio	0.774**	0.000
TLC	0.483**	0.000
Platelet	-0.593**	0.000
Cr	0.462**	0.000
Urea	0.623**	0.000
AST	0.754**	0.000
ALT	0.771**	0.000
PT	0.366**	0.001
PTT	0.415**	0.000
INR	0.403**	0.000
CRP	0.818**	0.000
pSOFA	0.785**	0.000
PRISMIII	0.842**	0.000
Na	0.064	0.565
K	0.320**	0.003

P-value>0.05: Non- significant; P-value<0.05: Significant; P-value<0.01: highly significant Spearman correlation coefficient

ill patients with sepsis .The cutoff value of> 302 ìL was a predictor for sepsis with a sensitivity of 80.95% and specificity of 76.19%

This is in agreement with Aharon et al. [15] study reported a significant increase in serum level of LDH at the onset of sepsis symptoms and suggested that presence of high serum LDH at admission required through investigations for sever underlying disease especially cancer and severe infections and can be consider as independent predictor factor of morbidity and mortality . Also Wacharasint et al. [18] assumed that patients with LDH levels in the normal-range (between 1.4 and 2.3 mmol/L) had markedly increasing risk of organ failure and higher mortality compared with patients who had LDH levels less than 1.4 mmol/L

Wasserman et al. [19] demonstrated that the finding of very high isolated LDH in admitted medical patients is a marker of unfavorable outcome and very high isolated LDH is an important distinguishing marker for the presence of a limited list of underlying diseases, mostly infections, particularly pneumonia, cancer (27% vs. 4%, in the LDH group and controls respectively, P < 0.0001), liver metastases (14% vs. 3%,P < 0.0001), and hematologic malignancies (5% vs. 0%, P=0.00019). Also Hendya et al. [20] study reported that LDH, albumin, CRP, and neutrophils% are important serum markers in determining community acquired pneumonia prognosis and they should be performed on admission to predict probable complications and outcome of patients with community acquired pneumonia. This can be explained by serum lactate dehydrogenase is present in almost all tissues So, during tissue damage LDH will released from most of this tissues and lead to elevated serum LDH level as well as decreased clearance in some cases such as septic conditions [21].

But in contrary Helliksson et al. [22] suggested that presence of LDH in all most cell types, making it an unspecific biomarker of

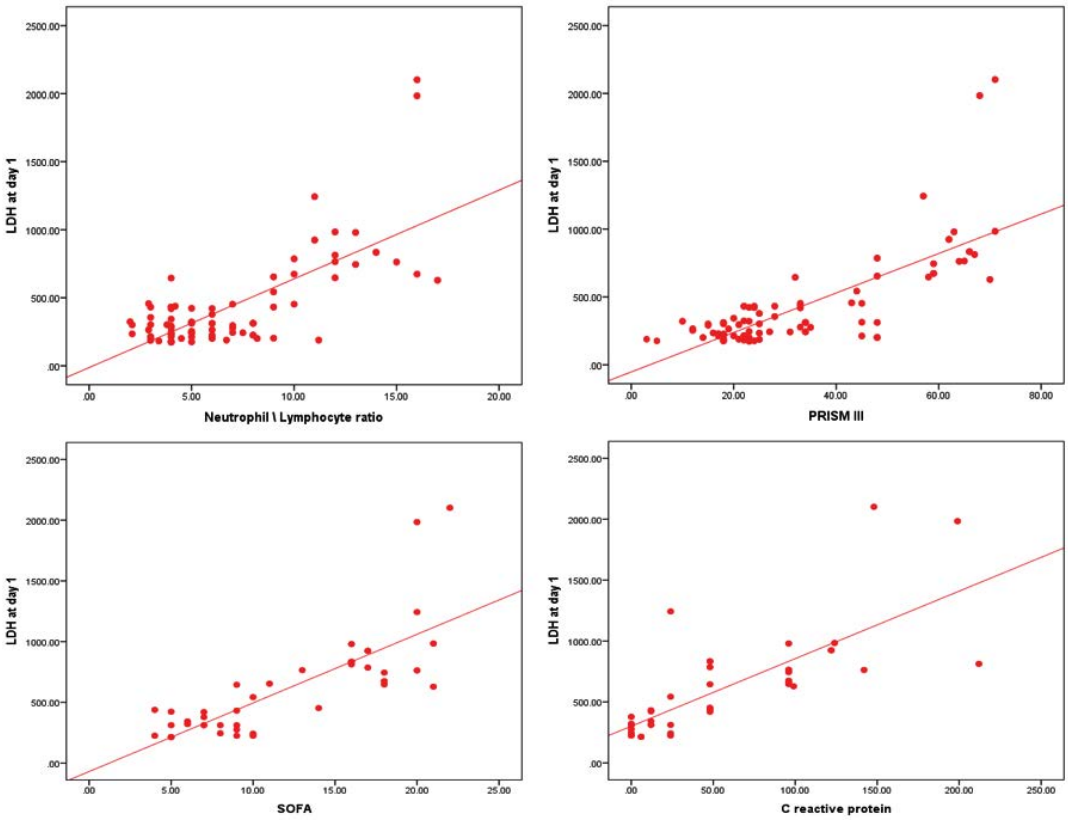

Fig. 1. Correlation of LDH on admission with neutrophil/lymphocyte count ratio, CRP and scoring system (pSOFA, PRISMIII)

cell damage anywhere in the body, and its level increases within minutes of a cell's entering a hypoxic-ischemic state. LDH has proven more valuable as prognostic biomarker for sepsis as elevated LDH levels have been associated with high mortality in several studies [23, 24]. While study by Zein et al. [25] reported increased serum LDH levels are commonly occurred in patients with severe sepsis and consider as a marker of cell injury that reflects the degree of tissue damage also Lu et al. [26] revealed elevated LDH was associated with 28-day mortality in patients with sepsis.

The present study showed positive correlation between serum and duration of hospital stay that in agreement with study by Halden et al. [4] that suggested early elevated LDH levels in children with suspected sepsis are associated with mortality, organ dysfunction and prolonged length of hospital stay.

Our study showed statistically significant correlation between lactate dehydrogenase (LDH) at admission and hemoglobin, granulocyte/ lymphocyte ratio, total leucocytic count (TLC), creatinine (Cr), Urea, aspartate transaminase (AST), alanine transaminase (ALT), C reactive protein (CRP) in cases group.

This can be explained by the level of inflammatory biomarker (CRP) is increasing with the severity of illness, so inflammatory biomarkers can be used as a diagnostic and prognostic factors,

Table 4. Relation of outcome with demographic and clinical data in cases group

Variable		Survival No.=50	Non-survival No.=34	P-value
Age in months	Median(IQR)	13(6–27)	13(9–25)	0.584
	Range	1–122	2–65	
Sex	Male	20(40.0%)	22(64.7%)	0.026
	Female	30(60.0%)	12(35.3%)	
Length of hospitalstay in days	Median(IQR)	9(7–12)	16(10–25)	0.000
	Range	5–18	8–34	
Diagnosis	Neurological disease	8(16.0%)	4(11.8%)	0.792
	Cardiovascular disease	8(16.0%)	8(23.5%)	
	Respiratory disease	20(40.0%)	14(41.2%)	
	Blood born infection	8(16.0%)	6(17.6%)	
Mechanical ventilation	No	44(88.0%)	18(52.9%)	0.000
	Yes	6(12.0%)	16(47.1%)	
SOFA	Median(IQR)	8(6–9)	18(17–20)	0.000
	Range	4–14	16–22	
PRISMIII	Median(IQR)	31(22 34)	63(59 67)	0.000
	Range	10–65	48–71	

P-value>0.05:Non-significant; P-value<0.05: significant; P-value<0.01: highly significant

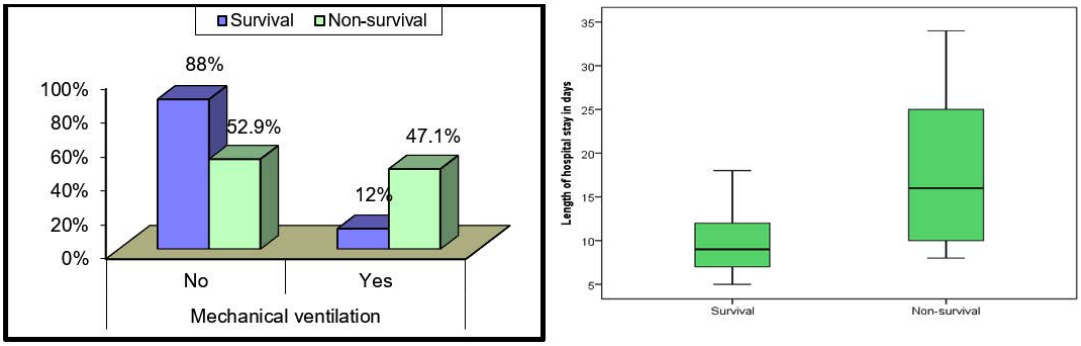

Fig. 2. Relation of outcome with length of hospital stay and mechanical ventilation in studied cases group

level of SGOT which is one of liver enzyme which increase with hepatic dysfunction &inflammatory cells as staff cell also increase with the severity of illness.

This is in agreement with Hussain and Kim [27] study concluded that CRP is used as one of the markers of choice in monitoring the acute phase response & McWilliam and Riordan [28] study showed that Serial CRP measurement can be used as a diagnostic tool for finding clinical infections, monitoring effects of treatment, outcome, and early detection of relapse of the disease. Also study by Pradhan et al. [29] revealed the value of CRP in predication of patients with suspected sepsis especially who present with the SIRS manifestation. Also, CRP could be very helpful in resource limited places, where recent biomarkers such as procalcitonin or interleukins unavailable.

Koozi et al. [30] suggested that high CRP level at admission (>100 mg/L) was associated with an high risk of 30-day ICU mortality as well as prolonged hospital stay in survivors

Huang et al. [31] showed that: amount of AST and ALT in the blood is directly related to the extent of the tissue damage. After severe damage, AST levels rise 10 to 20 times and greater than

Table 5. Relation of outcome with laboratory data in cases group

Variable		Survival No.=50	Non-survival No.=34	P-value
Hemoglobin	Mean±SD	9.27±1.47	8.10±1.25	0.000
	Range	6.3–12	5.7–10.2	
Neutrophil/Lymphocyte count ratio	Median(IQR)	6(4.2–8)	13(11–15)	0.000
	Range	3–12	10–17	
Total leukocytic count	Median(IQR)	9.5(6.2–12)	21(18–25)	0.000
	Range	2.1–21	3.2–35	
Platelet	Median(IQR)	234(201–432)	101(68–151)	0.000
	Range	42–567	33–534	
Cr	Median(IQR)	0.6(0.5–0.6)	0.7(0.6–1.7)	0.000
	Range	0.3–1.9	0.5–3.3	
Urea	Mean±SD	25.28±9.06	39.88±16.61	0.000
	Range	16–57	19–72	
AST	Median(IQR)	43(33–48)	102(67–133)	0.000
	Range	22–125	33–254	
ALT	Median(IQR)	27(21–35)	67(48–98)	0.000
	Range	16–98	27–201	
PT	Mean±SD	12.88±1.12	13.53±1.48	0.025
	Range	12–16	12–16	
PTT	Mean±SD	38.24±9.55	40.76±11.57	0.278
	Range	32–67	33–67	
INR	Mean±SD	1.25±0.30	1.53±0.67	0.011
	Range	1–2.1	1–3.1	
C-reactive protein	Median(IQR)	12(0–24)	96(96–124)	0.000
	Range	0–96	24–212	
LDH at day1	Median(IQR)	312(245–432)	834(745–980)	0.000
	Range	214–765	629–2102	
LDH at day2	Median(IQR)	256(209–387)	856(754–1267)	0.000
	Range	201–701	627–2134	
Na^+	Mean±SD	140.92±11.24	136.00±4.29	0.017
	Range	133–170	124–145	
K^+	Mean±SD	3.47±0.70	4.20±0.76	0.000
	Range	2.2–4.5	2.1–5.2	

P-value>0.05: Non- significant; P-value<0.05: significant; P-value<0.01: highly significant
•: Independent t-test; "': Mann-Whitney test

normal, whereas ALT can reach higher levels (up to 50 times greater than normal).

Our study showed statistically significantly elevation in NLR in case as compared with control as well as in non-surviving critically ill patients with sepsis and significant positive correlation with LDH. The NLR is a common inflammatory marker, calculated from complete blood cell counts. Zahorec et al. [32] who first used NLR as marker of systemic inflammation and a predictor of critical infections such as bacteremia and sepsis as well as severity of disease

This is in agreement with Gozdas et al. [33] that suggested higher NLR ratio may be useful in estimating nosocomial sepsis in hospitalized patients also found correlation between increased NLR and CRP elevation at the time of nosocomial sepsis.

Also Naess et al. [34] concluded role of NLR in distinguishing between patients with suspected septicemic bacterial infections from patients with other bacterial infections,as NLR higher in septicemic than non-septicemic patients. Zhang et al. [35] studied the diagnostic role of different hematological parameters in sepsis and suggested that value of NLR in predicting sepsis superior to CRP. Also the predictive value of the combination of NLR, platelet distribution width (PDW) and red cell distribution width (RDW) was almost equal to that of procalcitonin. In contrast study by Lowsby et al. [36] that found NLR alone was insufficient in predicting bacteremia as blood cultures were positive in 13.8% of patients.

Our study showed positive correlation between LDH, pSOFA, (r=0.785, P=0.000) and. PRISM III (r=0.842, P=0.000). Similarly, García-

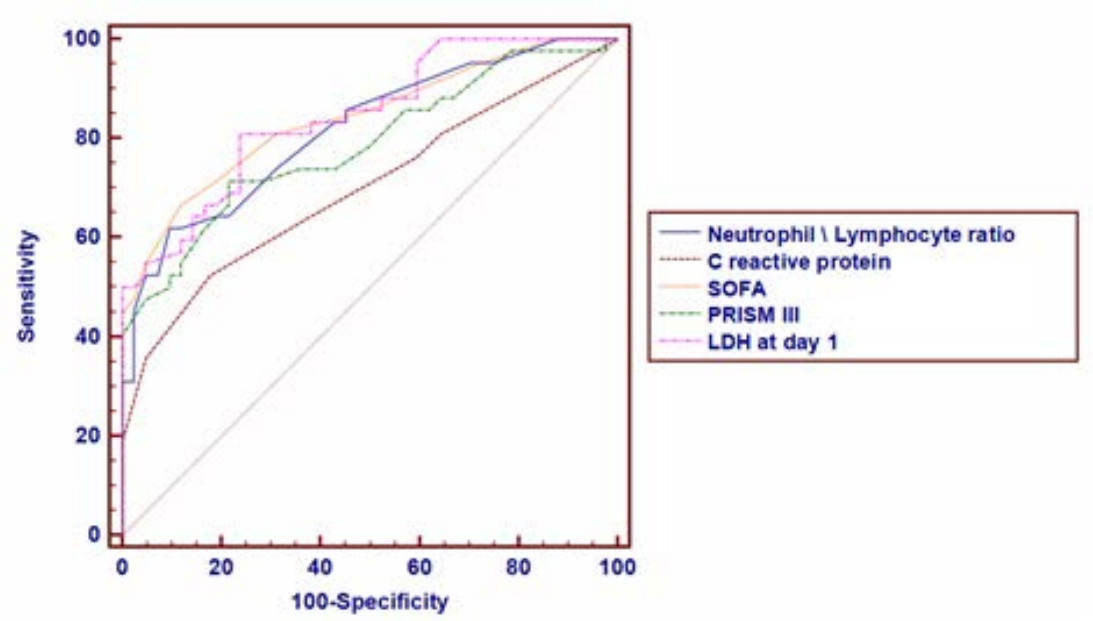

Fig. 3. Receiver operating characteristic curve (ROC) for the studied parameters as diagnostic markers for sepsis in studied groups

Variables	Cutoff point	AUC	Sensitivity	Specificity	+PV	-PV
Neutrophil/Lymphocyte ratio	>7.5	0.818	61.90	90.48	86.7	70.4
CRP	>24	0.700	52.38	82.14	74.6	63.3
SOFA	>8	0.840	66.67	88.10	84.8	72.5
PRISM3	>28	0.787	71.43	78.57	76.9	73.3
LDH at day1	>302	0.845	80.95	76.19	80.95	76.19

Table 6. Univariate and multivariate logistic regression analysis for predictors of cases group

Variable	Univariate P-value	Multivariate OR	95% C.I.for OR		P-value	OR	95% C.I.for OR	
			Lower	Upper			Lower	Upper
Length of hospital stay in days>11	0.000	7.848	3.368	18.284	–	–	–	–
Neutrophil/Lymphocyte ratio>7.5	0.000	15.437	6.590	36.164	0.011	5.072	1.454	17.697
Total leucocytic count>11.4	0.000	6.667	3.250	13.673	0.094	2.532	0.854	7.504
Creatinine>0.6	0.003	2.750	1.397	5.412	–	–	–	–
Urea>24	0.000	6.906	3.428	13.912	–	–	–	–
AST>49	0.000	6.727	3.062	14.779	–	–	–	–
ALT>44	0.000	6.113	2.780	13.440	–	–	–	–
PTT>42	0.002	4.613	1.762	12.076	–	–	–	–
INR>1.6	0.001	6.250	2.034	19.207	0.030	0.139	0.023	0.828
C-reactive protein>24	0.000	5.060	2.504	10.227	–	–	–	–
SOFA>8	0.000	14.800	6.642	32.976	0.001	6.871	2.274	20.763
PRISMIII>28	0.000	9.167	4.534	18.535	–	–	–	–
LDH at day 1>302	0.000	13.600	6.484	28.526	0.000	8.600	3.358	22.028

Table 7. Univariate logistic regression analysis for predictors of outcome in cases group

Variable	B	S.E.	Wald	P-value	Odds ratio (OR)	95%C.I. for OR Lower	Upper
Sex	-1.012	0.461	4.824	0.028	0.364	0.147	0.897
Length of hospital stay in days>9	2.420	0.606	15.977	0.000	11.250	3.433	36.862
Mechanical ventilation	1.875	0.554	11.431	0.001	6.519	2.199	19.325
Hemoglobin<=7.8	1.776	0.517	11.820	0.001	5.906	2.146	16.257
Neutrophil \ lymphocyte ratio > 9	1.525	0.420	13.176	0.000	4.597	2.017	10.474
Total leucocytic count>13.2	3.533	0.626	31.858	0.000	34.222	10.035	116.706
Platelet<=151	3.621	0.660	30.128	0.000	37.375	10.258	136.181
Creatinine>0.6	2.028	0.501	16.367	0.000	7.600	2.845	20.302
Urea>28	2.534	0.539	22.100	0.000	12.600	4.381	36.235
AST>65	3.171	0.594	28.498	0.000	23.833	7.440	76.351
ALT>35	3.168	0.627	25.532	0.000	23.750	6.951	81.146
PT>14	1.386	0.564	6.040	0.014	4.000	1.324	12.084
INR>1.4	1.052	0.527	3.987	0.046	2.864	1.020	8.043
C-reactive protein>24	3.925	0.801	24.041	0.000	50.667	10.551	243.311
PRISMIII>48	5.951	1.026	33.657	0.000	384.000	51.433	2866.937
K>3.9	2.028	0.501	16.367	0.000	7.600	2.845	20.302

Gigorro et al. [37] concluded that SOFA widely used for daily assessing acute morbidity and follow up critically ill patients in critical care units. This is in agreement with Chkhaidze et al. [38] who observed that pSOFA scores is an excellent tool to assess the extent of organ dysfunction in critically ill patients while PRISM III gives a good rank for diagnosis risk rather than specific organ involvement. This in agreement with study Zhou et al. [39] concluded pSOFA has better predictive value in the outcome of patients with suspected sepsis than PRISM III but studies by suggested that the PRISM III score had good sensitivity and specificity in prediction of mortality in septic patients.

CONCLUSION

Sepsis is one of most common cause of morbidity and mortality in pediatric ICU unless early detected and properly managed. The study suggests that serum LDH a simple and early marker can be a useful in diagnosis and prognosis of patients with suspected sepsis. A future studies on large sample size are required to confirm the precise role of serum LDH in early predication of sepsis especially in limited laboratory facilities hospitals.

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Conflicts of interest

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